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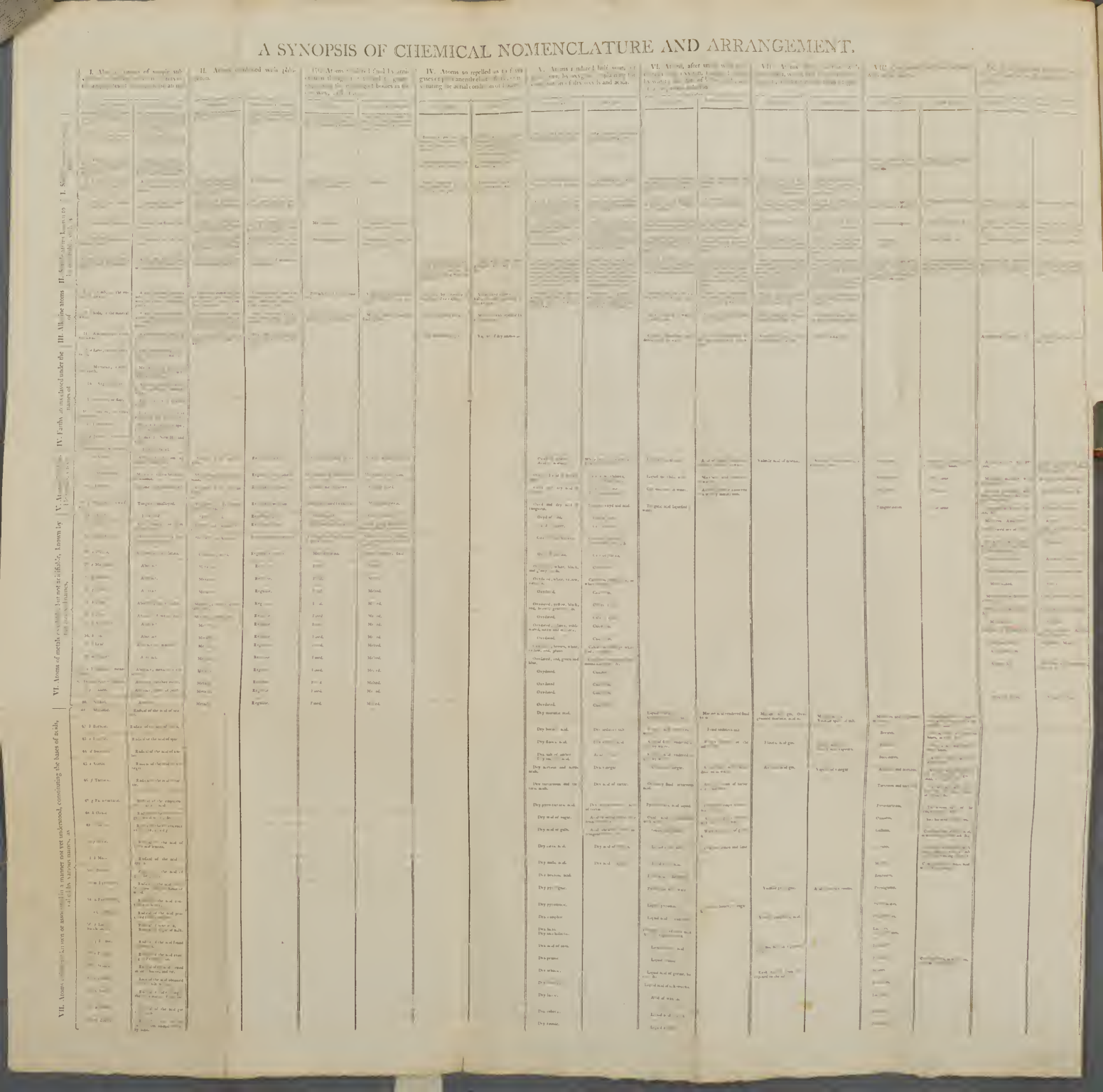
A SYNOPSIS OF CHEMICAL NOMENCLATURE AND ARRANGEMENT.



James Stevens
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EXPLANATION

OF THE

SYNOPSIS

OF

CHEMICAL NOMENCLATURE

AND

ARRANGEMENT:

CONTAINING

SEVERAL IMPORTANT ALTERATIONS OF THE PLAN ORIGINALLY REPORTED BY THE FRENCH ACADEMICIANS.

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EXPLANATION, &c.

AT a very early time the ancients were led to the belief of an attractive or organizing power in nature. Their philosophers seem to have thought there was a rude or chaotic state of matter, which preceded the introduction into it of symmetry and order. According to their opinion, the materials of the world, and of the universe, whether brought into existence by the hand of a Creator, or self-existent from all eternity, lay in a confused and shapeless mass; and would for ever have remained in that brute and inert condition, had they not been separated, sorted, and associated by an ATTRACTIVE POWER, or influence introduced among them.

This condition of things, the introduction of order into chaos, by means of attraction, was expressed, according to the fashion of those days, by an allegory. The

story was, that PAN, who had been, time immemorial, the tenant or superintendant of Chaos, became at length exceedingly uneasy that NOX, or Night, another of the inhabitants of Chaos, had laid an egg, out of which was hatched a son, whom she called EROS. As EROS grew, he acquired influence as well as strength, and so far excited the jealousy of Pan, that he determined to overcome him, and put an end to his increasing power. For this purpose he gave a challenge to Eros to contend with him in wrestling. This challenge was accepted, and after a full exertion of their respective forces, Eros was the victor, and threw Pan to the ground.

In this allegory, it has been conjectured by learned antiquarians, are contained valuable physical truths. By the reign of Pan, it is supposed, was meant the unorganized and amorphous state of matter. By the birth of Eros was intended the introduction of the attractive and regulating principle. And by the struggle which took place between them, was understood the conflict among the particles of matter

as they were acted upon by attractive and repelling powers. The defeat of Pan, and the victory of Eros, have been, in like manner, interpreted to signify the change which took place in the loose repulsive and chaotic state of things, when they were new-modelled and systematized by the coercive binding and predominating power of attraction. And in this sense did Eros overcome Pan.

The chaos in which matter was supposed to have been, was thus nothing more than that to which it might once more relapse, if the organizing or attractive power was removed. The dissolution of the affinities and relations between the ingredients which compose material beings, being suddenly affected, there could be no coherence of one to another to constitute any firm or figured substance, but obedient to their repulsive tendency, particle would universally be detached from particle, and this fair and symmetrical frame of things at once be dissolved.

The manner in which the Almighty created the matter of which the worlds consist,

is quite incomprehensible to the human understanding. Instead of vainly attempting to scan it, men act more becomingly in admiring these stupendous works, and adoring their Creator. Supposing, however, matter to have been barely created, but not yet organized, the primitive and natural constitution of its particles may be supposed to have been repulsive, each receding from each, and permitting no sort of association or union among themselves. In such a state one of the sublimest conceptions that the mind of man can entertain of Deity arises from his introduction of attractive powers into such a rude and undigested mass. Instantly, according to their respective affinities and relations, would the particles be drawn from their wild, scattered and disordered state; and shape, and colour, and consistence pervade the universe.

According to this view of the subject, matter is endowed with two properties; the one *repulsive*, and tending to confusion and disorder; the other *attractive*, and conducing to method and arrangement. *Repul-*

sion may be imagined to have scattered the particles through the immensity of space, and *attraction* to have gathered them into systems, worlds, solids, fluids, and into inanimate and animated beings.

Daily experience teaches that matter is mechanically divisible into parts, and these again into smaller parts, until, on arriving to the most minute subdivisions which our machines and instruments can reach, these exceedingly small bodies are expressed by the diminutive word "*particles.*" But our understandings are not limited to the comminuting operations of mills or files; by calculation the possibility of an infinite divisibility of matter can be made out; but the mind, weary with such abstract and endless investigation, wishes for a bound, or a resting-place, and stopping when it can divide and subdivide no further, calls the ultimate terms of its analysis, atoms or indivisible points.

These atoms are the materials which constitute the greatest as well as the least of the aggregate and compound bodies in creation, as units compose the highest as

well as the lowest of integral numbers that can be conceived. Of particles or atoms, it has pleased their Creator that natural bodies or beings should be formed; and in order to the constitution of these natural bodies, their constituent atoms have been furnished with attractive powers so opposing and balancing their repulsive powers, that the atoms may be conceived to be suspended, or held in equilibrium between the two. Each atom appears to be the subject of this two-fold influence; by virtue of its original repellency kept at a certain imaginable, though not always at a measurable, distance from other atoms; and yet, by reason of its inherent attractiveness, bound to its associates with greater or less degrees of force: and as these are variously modified, that is, as attraction and repulsion are exerted to different distances, and with different forces, the component atoms form hard or soft, or fluid, or elastic, or ductile kinds of things.

Matter may be thus conceived to consist of atoms infinitely small, balanced between attractive and repelling powers. If

the *attraction* in any congeries of atoms be relatively strong, the aggregate will have the qualities denominated *hard, solid* or *tough;* if the *repulsion* be strong, the aggregate will be soft, fluid or gaseous, &c. It is not necessary, in such a constitution, that the atoms should *absolutely* touch each other, or be in *mathematical* contact. Such *perfect* approximation perhaps never occurs. On the contrary, our most correct information teaches that it is impossible; the repellency between the atoms being considerably greater in the spaces infinitely near them than the attractive powers which the Creator has bestowed on them can overcome. The attractive forces, therefore, are limited: the atoms are drawn towards each other until they arrive at a certain proximity, and there stop. And by this wise and wonderful provision, the structure of many kinds of natural bodies, though they resist common and gross agents most powerfully, is so open and porous as to permit agents of a finer quality to pass through them with perfect convenience. Such is the constitution of transparent bo-

dies; such, for instance, as mountain-crystal and diamond in relation to *light:* and such is the condition of the most compact and opaque substances whatever in respect to *heat*. Experiments too have shown that animal membranes, earthen vessels, and even tubes of metal, are permeable by *aërial fluids* in certain circumstances. To what extent one kind of matter is compatible with the co-existence of other kinds is not yet known, though there are some curious facts on the subject: glass, for instance, may be penetrated by heat and light at the same time; and while under this double influence, may be susceptible of *electrical* excitement, and be penetrable by *magnetical* influence: and this same piece of glass, if drawn into a tube sufficiently small, may, at the same moment, exercise *capillary* attraction; yet, during the whole time, is itself obedient to the general attractive power called *gravitation*. But glass being a compound of flint and alkali, these two bodies are held together by another kind of attraction, called "*chemical*." Of how many more agencies or influences

glass may be the subject at the same instant, we are not as yet fully acquainted.

There are other facts of the same kind. They give us an excellent view of the economy manifested in the constitution of matter such as it is. By virtue of the mutual penetrability of many species of it, a great deal can be comprehended within a moderate space. As, a barrel may be filled with oranges, the spaces between the fruit may be occupied by pease, in the interstices of these sand may be introduced, water may be poured upon this, and, lastly, salt may be dissolved in the water, and the whole will afterwards be capable of receiving a portion of heat, and of being pervaded by electricity: so the clear atmosphere elevates water from the surface of the earth; this mixture of gases and water becomes the vehicle of numberless other vapours and meteors, and through this medley of materials the rays of light and heat, and the streams of electric fluid find their way, without the least impediment.

Admirable as this arrangement is, there is another property of these atoms no less

extraordinary. The attractive impulse which they obey is not exactly the same in all, but is made to manifest itself in many different ways. Of these atoms themselves, it will be remembered, we know nothing but from their effects and properties. Their essence is beyond our researches, and their infinite smallness renders it impossible for us to examine them either by touch or by sight. From their attractions and repulsions, which are all we know about them, we have been able to class them according to their similitudes; and judging from these, there do not at present appear to be more than between sixty and seventy sorts of uncompounded atoms in the whole fabric of our globe and its atmosphere. The manner of our becoming acquainted with the various properties of these atoms is entirely by analysis, and quite experimental. For instance, when it was found that a certain large proportion of the atoms of matter would not combine at all with pure water, but would strike fire with steel, and, in a proper degree of heat, melt with an alka-

line salt, and form glass, a peculiar name was given to this kind of atoms, and they were distinguished as being atoms of *silice* or *flint*. So, when it was discovered that certain other atoms, produced during the burning of wood, would readily dissolve in water, would remove filth and infection from clothes, would combine with oil into soap, and with septic acid into salt-petre, a proper and appropriate name was given them, and they were called atoms of *pot-ash*. In like manner, after it had been ascertained that certain other atoms were prone to combine with heat and light, and to form vital air, and then readily to quit their aërial associates, and connect themselves with coal and sulphur, and other acidifiable bases, and thereby to become sour, such were denominated atoms of *oxygen*. And by a similar process of the understanding, atoms of matter known to possess a specific gravity nineteen times greater than water, to be remarkably unchangeable in the fire, to amalgamate readily with quick-silver, and to resist the action of the ordinary acids, were named atoms of *gold*.

In these, and in all analogous cases, the words made use of are of the aggregate or *generic* kind; and, like all others of the same denomination, are *abstract* nouns, having no prototypes in nature. The words silice, pot-ash, oxygen and gold, are, in strictness, abbreviated forms of speech, meaning collections or aggregates of several different sorts of atoms; and these in states of perfect purity, unmixed with the smallest particle of any foreign material, and totally abstracted from all manner of commixture. As mixture, however, is so universally prevalent in nature, the assortments of atoms expressed by those generic or abstract names have never been seen in that extremely refined condition: nor is it necessary for human purposes or wants that they should be. Still, in a nomenclature of science, there is a propriety in imagining them so, and presuming hypothetically that such may be the case: for, after having supposed them perfectly pure, we can the more clearly and intelligibly proceed to state what other atoms they do and may combine with, and how far, and by what means, they acquire new

qualities by mixture. Logically, therefore, *oxygen* and *gold* are the generic names for associations of particular atoms, as *rosa* and *tulipa* are generic names for certain species of plants, or *army* and *multitude* generic names for different collections of men.

Among each of the sixty or more varieties of *simple* atoms into which matter is believed to be already divisible by analysis, the kind of attraction between like and like, separately considered, is called the attraction of *cohesion* or of *aggregation*, because it causes homogeneous atoms to cohere, and compacts simple atoms into aggregates or masses. But the other form of attraction alluded to in one of the preceding paragraphs is of a different quality, since it is exerted between atoms of *dissimilar* constitutions, and not among those which are homogeneous, or of the same constitution. It is therefore called the attraction of *mixture*, or *chemical* attraction. For example, the power by which atoms of pot-ash associate into a mass is the attraction of aggregation; but the power by

which that constitution is dissolved by water, or combines with sulphur or oil, is chemical attraction.

Chemical attraction, inducing mixtures of atoms, is by far the most common and prevalent case that occurs. Indeed, so prone are heterogeneous atoms to mingle with each other, that an instance of pure aggregation can scarcely, if at all, be found. It hence becomes necessary, in order to understand the structure and composition of natural bodies, to become well acquainted with the phenomena of mixture, to know how various and dissimilar sorts of atoms are associated by means of chemical attraction; and how these associations, after having answered the purposes for which they were intended, are dissolved or decomposed.

To facilitate the conception of these compositions and decompositions, it has been contrived to exhibit a large part of our knowledge of these matters in the form of a chart.

This chart is divided by perpendicular lines into nine columns, with appropriate

titles at the top. Each of these is intended to express some possible or actual condition of the sixty or more primitive forms of matter. For the sake of rendering the arrangement more easy to be comprehended, each of those columns is subdivided through its whole length into two. On the left side of this partition line is written the name of the several clusters or classes of atoms, and on the right the nearest corresponding terms, phrases or synonymes. The chart is further divided into compartments by horizontal lines crossing the former at right angles; and by tracing the name of the supposed simple or elementary substance along the line from left to right, some of its principal combinations will, in succession, be presented to the eye.

As in scientific investigations of all kinds, the analytic method, which proceeds from particulars to generals, is to be pursued by the person who first explores a subject, and instructs himself; so in scientific communications made to others on subjects already explored, the synthetic method is prefer-

able, as conveying in a more concise and striking manner, the sum of knowledge on a subject, methodically disposed.

The atoms of matter are so constituted as to attract each other and to combine in an endless variety. Observation, however, has taught, that there are certain combinations more frequent than others; as for instance, those of metals with phlogiston, and of acidifiable bases with oxygen, and of gaseous bases with caloric. It has been judged proper to express these and some other common forms of bodies at the heads of the great divisions of the chart, and to mark, in the spaces below those, the different composition of natural and artificial bodies, as far as they were known.

For the purpose of exhibiting these advantageously they are distributed under nine heads:

1. The abstract names of such atoms as are simple and uncompounded, or, in the present state of our knowledge are considered so. These appellatives are nouns, expressive, not of the respective families of atoms in any condition observable by

us, but of that pure and abstract state in which the understanding may conceive it possible for them to exist.

2. The names of primary atoms when combined with phlogiston; which phlogiston, as herein understood, means that kind of atoms which form the basis of inflammable air or hydrogenous gas, and no other kind.

3. The terms employed to express the state of dry fusion, or the condition of bodies melted without the aid or intervention of water. This is the condition of bodies whose atoms are considerably separated by anticrouon, the repelling principle, or what has been denominated caloric, though not sufficiently to evaporate them.

4. The names given to atoms so far repelled by anticrouon or caloric as to form gases or permanently elastic fluids. This is a state which rarely if at all exists, but which is necessary to be expressed in order the better to explain their states in the eighth column, when combined with water.

5. The names and terms under the fifth title are intended to express the state

of *dry* oxyd and acid. In this form bodies seldom or never exist (except metallic calces), on account of their very strong attraction for moisture. But this condition of *dry* oxyds and acids was necessary to be expressed for the sake of giving a better idea of their modifications by water in the two next columns.

6. Names and terms expressive of that condition of atoms when, after much repulsion by anticrouon or caloric, and attraction by oxygen, the compound is rendered liquid by water. This applies to acids in their ordinary and fluid state, and to all solutions of bodies in water.

7. This title denotes the condition of certain atoms, which exist in the form of gas, combined with a portion of water, and sometimes with oxygen. In this are included all the acids and alkalies when rarified to the vaporific state, as well as all gases or aëriform fluids.

8. Atoms, after combination with oxygen into oxyds and acids, combined with other bodies; as happens to acids in their junction with earths, alkalies and metals,

to form the very numerous order of neutral salts.

9. As the preceding column contained the acidified substances and their combinations, the present includes acidifiable substances, and some others in connection with substances not acidifiable and not forming neutral salts. Among other things, metallic ores and alloys of metals belong to this division.

Of the first Column.

Although it is not known that the ultimate structure of any natural body whatever is fully ascertained by analysis, yet in most bodies there can be no doubt of its having been done to a certain degree. The names of the substances arranged as simple or uncompounded in the first perpendicular column on the left hand of the chart, therefore, mean not that there is a physical impossibility of dividing them further, but that in the present state of our skill and knowledge, this has not been found practicable. Indeed, the proneness

of the different sorts of atoms to associate with each other is so great, that they never are found in their uncombined states, but invariably presented to our senses in the forms of junction or mixture. Still, as the understanding can conceive them abstracted from all connection whatever, the atoms are, by an easy fiction, supposed to be perfectly detached from every tie and alliance, and to be proper subjects for discriminative epithets or appellations. The list of the supposed elementary atoms is probably too long, and the sixty-four names which it contains will require considerable reduction. To what limit it will be necessary to carry this abridgment, future experiments and observations only can determine.

In placing the names, regard has been had to the importance of the substances intended to be expressed by them, and to the natural progress of the mind in acquiring a knowledge of them. For this purpose the terms in the column have been distributed into seven compartments. The reason of this will be obvious to him who

considers, that though the different sorts of atoms have particular characters of difference, they possess at the same time general marks of resemblance. Within the first bracket are comprehended such substances as are remarkably prone to fluidity, without becoming the bases of acids. The second contains the *bases of acids* which are *known*, in distinction to the *unknown*, and are not metallic, nor compounded. In the third are included the names for those atoms which are termed *alkaline*, and which have a remarkable proneness to unite with acids and to neutralize them. The denominations of the atoms called *earthy*, are contained in the fourth. The *metals* which are capable of being turned to acids are placed in the fifth. *Metallic* substances, convertible to *oxyds* and not to acids, are arranged in the sixth; and the seventh takes in the *unknown radicals* of all the remaining acids, many of which are presumed to be compounds, though, as they have not been hitherto analyzed, they are continued in the list of simples.

Four names are placed within the first

division of the column, to wit, anticrouon, light, phlogiston and oxygen, meaning atoms of these four several kinds.

Anticrouon, το αντικρουον, is the neuter termination of the active participle of the present tense, from the verb αντικρουω, to repel or keep at a distance. It is intended to express the principle or agent which produces repulsion among the atoms of matter: and as repulsion always exists among the constituent elements of bodies, the repelling principle would always seem to be there. In many cases we can ascertain its presence by our sensations, by instruments and machines; and we know, that, according to the force or intensity of it, may a solid body undergo mere expansion, or be dilated to a liquid or melted state, or be repelled so powerfully as to become volatile or to rise in vapour. A word which expressed all these effects, or rather the influence by which such effects were produced, has a happy operation upon the mind, by suggesting to it invariably the principal modifications of matter in which it is instrumental. It was stated in the

preliminary remarks, that the atoms of which bodies consisted, did not come into *perfect contact* under any circumstances in which we were acquainted with them, because there was repulsive agency among them powerful enough to prevent it. This repulsion has, by some philosophers, been supposed to inhere in the atoms themselves, and to be a part of their nature; while others ascribed it to a foreign agent introduced among them. However the fact may be, this we know for certain, that when, from the solar rays, from culinary heat, or the fire of a furnace, the repelling principle, or anticrouon, is introduced among the particles of any body, it increases the common repulsion existing there, and, if carried far enough, will evaporate and dissipate them. Since, therefore, repulsion, as far as we are acquainted with it, in bodies considerably heated, is occasioned by anticrouon, it is fairly presumable, that, in other cases, where its effects are less obvious to us, as in their ordinary and low temperatures, a more moderate action of the same principle im-

parts to their component atoms their common or ordinary rate of repulsion. We know of no state wherein there is an absolute and total privation of caloric or anticrouon, and of course we know not of any condition of bodies wholly exempt from its repulsive power. Anticrouon, then, the repeller, the repelling principle, or the principle of repulsion, seems, upon strict examination, universally to produce separation or dilatation among the atoms of bodies after its introduction into them. And this idea is more simple than the supposition of one repelling power inherent in the atoms themselves, and another as an inseparable property of caloric.

Among the effects of anticrouon upon sentient beings, as man, is a sensation called heat; and this name has been very generally used also to signify, besides the sensation, the agent causing the sensation. There would, for this reason, be great impropriety in retaining, for philosophical purposes, the word "heat," which denotes both the stimulus which excites the sensation and the sensation excited. But there is a more

serious objection than this: neither the term heat, nor any of its derivatives, express chemical or physical qualities. They signify only *one* of the various modes by which anticrouon, or the principle of repulsion, operates; to wit, the sensation it excites when moderately acting on the human organ of touch; but there are numberless gradations of repulsion among the atoms of natural bodies, which produce no acute sensation at all upon it. And when the human skin is acted upon by some of the lower degrees of it, the effect wrought is not called *heat*, but *cold*. Hence it appears, that the sensation of *heat*, which gives a term that tinctures all this part of philosophy, is very limited even in a sentient being; and two words, with opposite meanings, are introduced into all discussions, and are unavoidably, by these means of association, brought to mind. To show how improper the word heat, or caloric, or calorific, is, we need but to recollect that the principle so named existed before man existed to feel it; and may continue to operate upon more durable

things, when the race of man shall be no more. The word "fire" is also improper, as it signifies merely another mode by which anticrouon acts, that is, in the decomposition of inflammable substances with an extrication of sensible heat and light. The most obvious and extensive effect of this sort of atoms being repulsive, their generic name ought to be derived from this property, and to express it. Wherever the word was pronounced, we should think of this predominating operation of it, upon all matter, without the needless incumbrance of words, and their ideas and associations, derived from human feeling. Thus, *dilatation* might be the common name to express the effect of anticrouon on hard and fixed substances, as the metals; *expansion*, to signify an enlargement of volume in the same or similar bodies, when melted; *evaporation*, the conversion of fixed substances to airs or vapours; *heat*, when affecting the nerves of a sentient being in a particular manner; *fire*, when acting on a combustible substance, &c. By modelling the language

in this manner, anticrouon, or the repelling principle, would always be presented to the mind; and the heating effect on man and other creatures, instead of being incessantly obtruded on the memory, would be occasionally brought up when that particular effect of anticrouon was under consideration. But as those effects of repulsion called *heat* and *fire* are most familiar to man, they have been most commonly introduced into discourse and writing, not only about *sentient* bodies and *combustible* substances, but have been applied to those which possess neither feeling nor inflammability. The phenomena of anticrouon have therefore been confusedly stated, and some incongruities have clouded the subject. If the earth is to be reserved for destruction by fire, the elements to be melted with a fervent heat, and the works that are therein to be burned up, all that is necessary to be conceived for the accomplishment of such a dissolution of the fabric of nature, is a mere abolition of the power of attraction among the atoms, or an increase of repellency, whereby the

existing coherence may be overcome. This destruction of the compages of matter is the counterpart of that process, which, during the time of its organization, drew its atoms together. And the same providence which, by a predominance of attractive power, organized the world, can, by simply augmenting the repulsive power (anticrouon or fire), instantly disorganize it. And this sentiment, so understood, is as agreeable to correct philosophy as to sound theology.

Thus it appears, that anticrouon, or the repelling power, is incessantly present in all the substances with which we are acquainted. Being the universal cause of repulsion in the atoms of which bodies consist, there is an impossibility of conceiving their present constitution without taking it into consideration: and, therefore, as indispensibly necessary to the existence of all the modifications of matter, *anticrouon* the repeller, instead of caloric the heater, is placed at the head of the list.

Next in their generality and importance are atoms of *light*, which, like other sub-

stances, appear to derive their fluidity from the repulsive operation of anticrouon. Possessing a constitution capable of being more easily acted upon by this agent than any thing we know, their usual condition is that of an extremely subtile and active fluid. Light has been generally considered as a fluid *per se*, or as being *essentially so* after the manner that anticrouon is supposed to be. This, however, seems to be a mistake; for, besides the analogy of all other cases of fluidity being caused by the repulsive principle, late experiments have shown a nearer connection between light and anticrouon than has been commonly understood. The just interpretation of these leads to a belief that the sun-beam is composed of anticrouon and light, and whenever, by any means, light is attracted or fixed by another body, the repulsive principle is disengaged. From this constitution of light, abundance of the phenomena relative to the connection between heat and light can be well understood.

The third assemblage of atoms is that which, in its aggregate capacity, is called

phlogiston. This word, το φλογιστον, which is one of the best imagined in the whole nomenclature, has been rejected by the French and all their imitators, and, I think, unreasonably and improperly. It means all those atoms in bodies which *burn with flame or blaze.* This quality distinguishes them from atoms of carbone, which, if pure, burn indeed, but without any blaze whatever. It is the basis of fire-damp or inflammable air, and enters largely into the ordinary composition of sulphur, phosphorus and metals, giving to them the power of burning *with flame.* Phlogiston is a plentiful ingredient in animal and vegetable bodies, and evidently enters into the composition of water; these being all capable of exhibiting blaze as they burn. From its being a constituent part of water, it has been called hydrogen, or the water-getter, and is distinguished by that name in all the modern books. But as generic names ought to be taken from the most obvious quality which any assemblage of atoms possesses, and as the exhibition of blaze is a more glaring appearance than

the formation of water, the former deserves the preference in giving a title to the genus.

Atoms of oxygen occupy the fourth place. These are so denominated, because, when combined with the acidifiable bases which follow, they *turn sour;* or *produce acidity.* The common form in which oxygen, or the *sour-getter,* exists, is in connection with anticrouon and light, constituting vital air, or what has been called oxygenous gas. It exists plentifully, too, in all acids, in whose constitution it is an indispensible ingredient. But oxygen, though it produces sourness by combination with certain other atoms, does not itself appear to be sour. Nor is it capable of imparting sourness to every thing with which it combines: for there are many sorts of atoms with which oxygen does not unite to the point of acidity. These are called *oxyds.* Such substances as gum, sugar, meal, starch, mucilage, and the like, are vegetable oxyds; saliva, lymph, mucus, semen, blood, and the like, are animal oxyds; and litharge, minium, red precipitate, flowers of zinc, and the like, are me-

tallic oxyds. The old name for oxygenated metals was calx. This too is the word for lime; and they were called calces, from a supposed resemblance between metallic oxyds and quick-lime. But since the total dissimilarity of a calx and an oxyd has been proved both synthetically and analytically, it has been found necessary to distinguish them by different names. This term, like the others, is an abstract one; it not being known that atoms of oxygen exist in their simple or naked form any where in nature.

The next four names have been applied to such atoms as are *known* to constitute acids with oxygen, and are therefore denominated ACIDIFIABLE BASES. They are placed by themselves, to distinguish them from the other bases of acids that follow, which are either *unknown*, or not correctly known.

The first of these is *Carbone*, a word derived from carbo, a burning coal, which signifies elementary charcoal; that is, charcoal freed from phlogiston or hydrogen, oxygen, water, and every possible foreign

admixture. As it is never found in a state of extreme purity, the name is given to that state in which it may be imagined to exist totally insulated from every other material thing. Atoms of carbone are very abundant in creation, existing in the soil of fertile lands, in the bodies of plants and animals, as well as in coal mines. They are the basis of carbonic acid, which has often been called "fixed air," and of oil, tar, and many other combustible bodies.

Atoms of *sulphur*, or *brimstone*, are very prone to combine with oxygen; and when they do, they form dry sulphuric acid, a compound which, when dissolved in water, has been called *vitriolic acid*, and which is still known in the shops by that name. The term Sulphur, in its scientific sense, no more means the common brimstone of commerce, than carbone signifies ordinary charcoal: for sulphur appears to have a peculiarly strong attraction for phlogiston, or the base of inflammable air, and to be associated with it in all known circumstances. It will even decompose water, to obtain its phlogiston, if it cannot derive

it from a more ready source. Common brimstone is only one of the modifications of abstract or elementary sulphur.

Atoms of the third genus of this order are called in the aggregate *Phosphorus*. They generally attract oxygen so powerfully as to be separable with great difficulty. Hence it is commonly found in the form of phosphoric acid in the bones and excretions of animals, and in some vegetable and even mineral substances. But when phosphorus has been disoxygenated by art, it is not a simple or uncombined substance; for, as prepared in laboratories and for the purposes of the arts, it seems to be connected with much phlogiston, enabling it to burn with blaze, and form water during the process, after the manner of brimstone. The term, then, like the rest, applies to phosphoric atoms, disengaged from all combination whatsoever; but as they were never known to exist in such a state of separation, the name refers to that state of abstract purity in which the mind may conceive them to be.

The fourth group of atoms is denomi-

nated by the generic word *Septon*. They enter into the composition of several parts of organized matter, and wherever they are found they give to it the quality of leanness (the state which is not oily or fat) during life, and of rapid corruption after death. Certain vegetables contain septon, which they either derive from the atmospheric air which passes through their vessels, or from the manure and nutrimental substance surrounding their roots. When they contain it they are found to approach the chemical qualities of animals. By the aid of septon, potatoes, cabbages, wheat, tobacco, and other plants have been observed to grow with great luxuriance; but, at the same time, when overdosed with it, they become rank and ill-flavoured. Millers observe that wheat, for example, raised on fields manured with the refuse-matter and putrid nastiness of the streets of New-York, is uncommonly offensive as it comes from between the stones which reduce it to meal: and such vegetable productions are very prone to corrupt. When they putrefy, the septon escapes, commonly with anti-

crouon, in the form of septous gas. But it does not always go off in that manner; for sometimes it appears to form a chemical union with oxygen, and after that, being dilated with caloric and blended with water, to exist in the states of septic oxyd, septic acid, and septic acid gas. In the condition of septous air it possesses no vital properties, nor any that are directly noxious. Hence that air has been called *azotic*, or lifeless gas, and its basis *azote*, or non-vital; and is so distinguished in most of the books. Much has been said of the injurious effects of vegetable putrefaction, as if all vegetable bodies were noxious as they rotted. But this is not correct; for the greater part of the sub-acid fruits, as grapes, apples, &c. afford no unhealthy air by corruption; and the like observation applies to olives, lint-seed, and other oily substances. Vapours directly injurious seem to proceed only from such plants, or their parts, as contain septon; and then only when it becomes active by oxygenation. *Oxygenated septon*, which seems to be the very matter that gives a pestilential taint to the air, dif-

fers from *atmospheric air* in this, that, in the former, septon and oxygen are chemically united base to base, while in the latter their bases have no chemical connection, but, volatized separately by anticrouon, their particles float through each other uncombined, like globules of oil and water agitated together. Septous and oxygenous gases, in their uncombined state, constitute a wholesome atmosphere; in their connected state, an unwholesome or pestilential one.

The third bracket contains the atoms of matter which have been denominated *Alkaline*. They are of three sorts; those of pot-ash, soda, and ammoniac. Serious doubts have been entertained whether they ought to be ranked among the elementary bodies, as they seem to be formed from combinations of simple atoms during the decomposition of organized bodies, as those of plants and animals, by fire. It has been supposed by some, that pot-ash and soda pre-exist in the bodies of the vegetables from whose ashes they are extracted. But this seems to be a mistake; for there

are more cogent reasons to induce a belief that both of the fixed alkalies are produced during incineration, and consequently are creatures of the fire. Yet, though there can be scarcely a doubt of their compound nature, they are continued in the catalogue of simple substances, because we do not exactly know what their constituent parts are. And ammoniac, or the volatile alkali, though its component ingredients have been discovered, is placed along with them; though there would be difficulty in vindicating its claim to the place assigned it. Alkalies, particularly the two former, seem to be the most powerful of all antiseptics; they are likewise the great agents in removing filth and uncleanness, and thereby are enabled to counteract the causes, and withstand the effects, of pestilential fluids.

The atoms which constitute the different earths are arranged within the fourth division of this column. Of the existence of such as those denominated *lime*, *clay*, *magnesia*, *flint*, and *barytes*, there can be no doubt; though a belief is entertained,

and not without reason, that lime, as well as the fixed alkalies, is a compound of certain simple substances not yet ascertained.

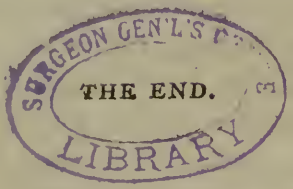
The next compartment includes the atoms of matter referable to the head of *Earths*. These are distinguished plainly from each other; and the names of lime, magnesia, clay, flint, and barytes, are given to the most plentiful and important of them. To the less plentiful and interesting of them are given the names of strontian, jargon, and glucine.

Then the *acidifiable metallic* substances are placed by themselves; and the aggregate denominations of these atoms are arsenic, molybdœna, chrome, and tungstein: thus there are four metallic acids. After these are placed the *metallic* substances, which are only *oxydable:* the terms by which these collections of atoms are distinguished are gold, silver, quicksilver, platina, manganese, bismuth, cobalt, iron, zinc, antimony, tin, lead, copper, titanium, sylvanite, uranite, nickel; making in the whole seventeen metallic oxyds.

Thus far the substances enumerated, or the greater part of them, are presumed to be tolerably well known or understood; but in the remainder of the column, the substances enumerated are confessedly not simple or elementary: they are compounds, though we have not been able as yet to discover, by analysis, what their composition exactly is. They are twenty-four in number, and form the bases of as many acids. Though it is known that these acids, like all others, contain oxygen, it is not known specifically with what that oxygen is associated; therefore, in applying names to these supposed radicals, the names have been given them in an inverse manner, derived from the common denominations of the acids which contain them; whereas, in direct and logical proceeding, the radical ought to be named first, and the acid to derive its denomination from that radical. The obscure and unknown constitution of these *twenty-four bases of acids*, constitute a large part of the terra incognita of Chemistry. But it is to be hoped, that perseverance in analytical

researches will, before long, introduce simplicity and correctness into this, as well as into other parts of the science. It must be observed, however, that though some uncertainty attends our knowledge of their intimate constitution, yet the compounds formed by the union of these acids with alkalies, earths and metals, are almost as much the subjects of correct knowledge and experiment as any other bodies whatever. As far as analysis has already approximated towards truth on the nature of these acidifiable bases, there is reason to believe that the acetic, the tartaric, the malic, the pyro-tartaric, and the citric, have nearly a similar constitution. If this should ever be fully established, the number of elements will be proportionally diminished. Perhaps some others, such as the prussic, formic, lactic, saccholactic, bombic, sebacic, and zoonic, will be found ultimately to be but modifications of the same rudiments. Should this be ever ascertained, the catalogue will be accordingly abridged; and indeed the same remark will apply to the muriatic, boracic,

fluoric, succinic, oxalic, benzoic, pyro-mucic, camphoric, laccic, suberic, and whatever of similarly constituted acids may at any time hereafter be discovered.



THE END.